

WE CLAIM:

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1. A modular data storage system for handling and storing data cartridges, comprising:
- a) a cartridge access device;
 - b) at least two laterally adjacent modular units, each of said modular units comprising:
 - i) a plurality of cartridge receiving devices;
 - ii) a first elongate gear rack aligned along a displacement path;
 - iii) a second elongate gear rack aligned along said displacement path and positioned in spaced-apart relation to said first elongate gear rack; and
 - iv) wherein the first elongate gear racks of said laterally adjacent modular units are substantially in alignment with one another, and the second elongate gear racks of said laterally adjacent modular units are substantially in alignment with one another, such that said cartridge access device may be translated among said laterally adjacent modular units;
 - c) a translation apparatus for moving a cartridge access device along a displacement path, comprising:
 - i) a first drive pinion mounted to the cartridge access device, said first drive pinion engaging said first elongate gear rack;
 - ii) a second drive pinion mounted to the cartridge access device, said second drive pinion engaging said second elongate gear rack; and

Sub A1

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iii) a pinion drive apparatus operatively associated with said first and second drive pinions, said pinion drive apparatus rotating said first and second drive pinions to move the cartridge access device among the first and second elongate gear racks of said laterally adjacent modular units.

2. The modular data storage system of claim 1, wherein said first elongate gear rack includes a first elongate guide member that extends along the displacement path substantially between the first and second ends of said first elongate gear rack and wherein said translation apparatus further
5 comprises a first bearing mounted to the cartridge access device, said first bearing engaging said first elongate guide member.

3. The modular data storage system of claim 2, wherein said first elongate guide member comprises first and second opposed bearing surfaces and wherein said first bearing mounted to the cartridge access device slidably engages the first and second opposed bearing surfaces of said first
5 elongate guide member.

4. The modular data storage system of claim 3, wherein said second elongate gear rack includes a second elongate guide member that extends along the displacement path substantially between the first and second ends of said second elongate gear rack and wherein said translation
5 apparatus further comprises a second bearing mounted to the cartridge access device, said second bearing engaging said second elongate guide member.

5. The modular data storage system of claim 4, wherein said second elongate guide member comprises first and second opposed bearing surfaces and wherein said second bearing mounted to the cartridge access device slidably engages the first and second opposed bearing surfaces of said second elongate guide member.

6. The modular data storage system of claim 5, further comprising a third bearing mounted to the cartridge access device, said third bearing contacting said first elongate gear rack and allowing the cartridge access device to move along the displacement path.

7. The modular data storage system of claim 6, wherein said third bearing comprises a wheel.

8. The modular data storage system of claim 1, each of said modular units further comprising:

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- a) a third elongate gear rack positioned in generally parallel, spaced-apart relation to said first elongate gear rack;
 - b) a fourth elongate gear rack positioned in generally parallel, spaced-apart relation to said second elongate gear rack so that said first, second, third, and fourth elongate gear racks define a generally rectangular, parallelepiped configuration with said first and third elongate gear racks defining a bottom side of the generally rectangular, parallelepiped configuration and said second and fourth elongate gear racks defining a top side of the generally rectangular, parallelepiped configuration; and
 - c) wherein the third elongate gear racks of said laterally adjacent modular units are substantially in alignment with one another, and the

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fourth elongate gear racks of said laterally adjacent modular units are substantially in alignment with one another, such that said cartridge access device may be translated among said laterally adjacent modular units.

9. The modular data storage system of claim 8, said translation apparatus further comprising:

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- a) a third drive pinion mounted to the cartridge access device and operatively associated with said pinion drive apparatus, said third drive pinion engaging said third elongate gear rack; and
- b) a fourth drive pinion mounted to the cartridge access device and operatively associated with said pinion drive apparatus, said fourth drive pinion engaging said fourth elongate gear rack.

10. The modular data storage system of claim 1, wherein said pinion drive apparatus comprises:

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- a) a motor having a shaft;
- b) a worm attached to the shaft of said motor; and
- c) a worm gear operatively connected to said first and second drive pinions, said worm gear mounted to engage said worm mounted to the shaft of said motor.

11. A modular data storage system for handling and storing data cartridges, comprising:

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- a) a cartridge access device;
- b) a master modular unit and at least one slave modular unit, each of said modular units being positioned adjacent one another to form

laterally adjacent modular units, each of said modular units comprising:

- i) a plurality of cartridge receiving devices;
 - ii) a first elongate gear rack aligned along a displacement path;
 - iii) a second elongate gear rack aligned along said displacement path and positioned in spaced-apart relation to said first elongate gear rack; and
 - iv) wherein the first elongate gear racks of said laterally adjacent modular units are substantially in alignment with one another, and the second elongate gear racks of said laterally adjacent modular units are substantially in alignment with one another, such that said cartridge access device may be translated among said laterally adjacent modular units;
- c) a translation apparatus for moving a cartridge access device along a displacement path, comprising:
- i) a first drive pinion mounted to the cartridge access device, said first drive pinion engaging said first elongate gear rack;
 - ii) a second drive pinion mounted to the cartridge access device, said second drive pinion engaging said second elongate gear rack; and
 - iii) a pinion drive apparatus operatively associated with said first and second drive pinions, said pinion drive apparatus rotating said first and second drive pinions to move the cartridge access device among the first and second elongate gear racks of said laterally adjacent modular units;
- d) said master modular unit further comprising a power supply.

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12. The modular data storage system of claim 11, said master modular unit further comprising a control system operatively associated with said pinion drive apparatus.

13. The modular data storage system of claim 11 wherein each of said slave modular units which require electrical power is electrically connected to said power supply in said master modular-unit.

14. The modular data storage system of claim 1, wherein said first elongate gear rack includes a first elongate guide member that extends along the displacement path substantially between the first and second ends of said first elongate gear rack and wherein said translation apparatus further
5 comprises a first bearing mounted to the cartridge access device, said first bearing engaging said first elongate guide member.

15. The modular data storage system of claim 14, wherein said first elongate guide member comprises first and second opposed bearing surfaces and wherein said first bearing mounted to the cartridge access device slidably engages the first and second opposed bearing surfaces of said first elongate guide member.
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16. The modular data storage system of claim 15, wherein said second elongate gear rack includes a second elongate guide member that extends along the displacement path substantially between the first and second ends of said second elongate gear rack and wherein said translation
5 apparatus further comprises a second bearing mounted to the cartridge

access device, said second bearing engaging said second elongate guide member.

17. The modular data storage system of claim 16, wherein said second elongate guide member comprises first and second opposed bearing surfaces and wherein said second bearing mounted to the cartridge access device slidably engages the first and second opposed bearing surfaces of said second elongate guide member.

18. The modular data storage system of claim 17, further comprising a third bearing mounted to the cartridge access device, said third bearing contacting said first elongate gear rack and allowing the cartridge access device to move along the displacement path.

19. The modular data storage system of claim 18, wherein said third bearing comprises a wheel.

20. The modular data storage system of claim 11, each of said modular units further comprising:

- a) a third elongate gear rack positioned in generally parallel, spaced-apart relation to said first elongate gear rack;
- b) a fourth elongate gear rack positioned in generally parallel, spaced-apart relation to said second elongate gear rack so that said first, second, third, and fourth elongate gear racks define a generally rectangular, parallelepiped configuration with said first and third elongate gear racks defining a bottom side of the generally rectangular, parallelepiped configuration and said second and fourth elongate gear

racks defining a top side of the generally rectangular, parallelepiped configuration; and

- 15 c) wherein the third elongate gear racks of said laterally adjacent modular units are substantially in alignment with one another, and the fourth elongate gear racks of said laterally adjacent modular units are substantially in alignment with one another, such that said cartridge access device may be translated among said laterally adjacent modular units.

21. The modular data storage system of claim 20, said translation apparatus further comprising:

- 5 a) a third drive pinion mounted to the cartridge access device and operatively associated with said pinion drive apparatus, said third drive pinion engaging said third elongate gear rack; and
b) a fourth drive pinion mounted to the cartridge access device and operatively associated with said pinion drive apparatus, said fourth drive pinion engaging said fourth elongate gear rack.

22. The modular data storage system of claim 11, wherein said pinion drive apparatus comprises:

- 5 a) a motor having a shaft;
b) a worm attached to the shaft of said motor; and
c) a worm gear operatively connected to said first and second drive pinions, said worm gear mounted to engage said worm mounted to the shaft of said motor.

23. A modular data storage system for handling and storing data cartridges, comprising:

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- a) a cartridge access device;
- b) at least two laterally adjacent modular units, each of said modular units comprising:
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- i) a plurality of cartridge receiving devices; and
- ii) an elongate gear rack aligned along a displacement path;
- c) a translation apparatus for moving a cartridge access device along a displacement path, comprising:
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- i) guide means mounted to said elongate gear rack for guiding the cartridge access device along said displacement path;
- ii) a drive pinion mounted to the cartridge access device, said drive pinion engaging said elongate gear rack; and
- iii) pinion drive means operatively associated with said drive pinion for rotating said first drive pinion to move the cartridge access device along the displacement path;
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- d) wherein said elongate gear racks of said laterally adjacent modular units are substantially in alignment with one another such that said cartridge access device may be translated among said laterally adjacent modular units.